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Mapping from the ground up

Thanks to maturing technology, foresight, and multi-agency cooperation, Franklin County (Wash) Public Utility District (PUD) No. 1 has done in two years what takes some utilities more than a decade: It built a highly accurate automated mapping/ facilities management/geographic information system (AM/FM/GIS) and made it possible to share the data with other organizations. Much of what the PUD has

Aerial photogrammetry of urban areas resulted in a resolution of about 1 ft/pixel; rural areas (right) had a 2-ft/pixel resolution

In rural areas, data collector "Digital Dave" Sakrisson traveled from pole to pole by motorcycle

Attributes for each facility were collected in an Access data base on a rugged laptop computer

Facility locations were determined by GPS readings, which were also collected on the laptop

accomplished or plans to do can be attributed to mainstream IT solutions permeating the AM/FM/GIS arena—including standard data bases, Microsoft Office applications, and the Internet. But the utility's success is no less the result of the care with which it maintained its legacy systems, and the thoughtful IT investments made by a consortium of local government agencies.

An order of FRIS

The PUD is part of a local consortium formed in 1992 called the Franklin County Regional Information Systems (FRIS), which also includes the South Columbia Basin Irrigation District, the Franklin County assessor's office, and the county's public works department. In 1993, FRIS hired Rogers Surveying Inc, Richland, Wash, to construct a Public Land Survey System (PLSS) wire frame representation of the county. Global positioning system (GPS) units were used to obtain highly accurate positions for section corners throughout the county, as well as quarter-section corners in urban areas. The resulting grid provided superb control for subsequent AM/FM/GIS efforts. "It cost a little bit more money to do up front," says Dean Oberlander, distribution engineer for the PUD, "but when we pull [aerial] photos and other data in, they overlay on the grid very nicely—everything fits."

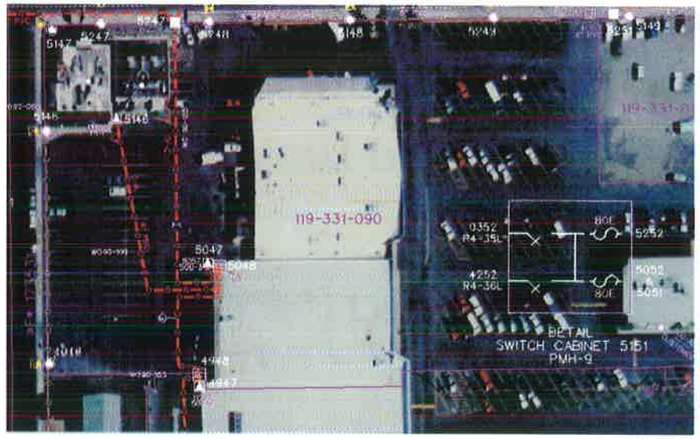
In 1996, FRIS hired Integrated Desktop Solutions (IDS), Beaverton, Ore, as the primary contractor to help create a county-wide GIS, with a shared base map and special applications for each FRIS member. FRIS members use Bentley Systems' (Exton, Pa) Microstation and MGE software from Intergraph Corp, Huntsville, Ala, as their GIS environment. To create the base map, Spencer B Gross Inc, Portland, Ore, was subcontracted to perform digital orthophotography, using airborne GPS and 32 ground control points to maintain high-level accuracy. Performed in March 1996, the flights photographed the 1000-mi^2 county in two days. On the final maps, resolution in urban areas is about 1 ft/pixel; 2 ft in rural areas.

Then IDS constructed parcel features over the base map for use by the assessor's office and other FRIS members. Maps from the South Columbia Basin Irrigation District were scanned, and irrigation features—such as canals and ditches—were digitized and tagged for delivery into MGE.

Digital Dave

However, given the accuracy of the developing land base, IDS decided against traditional conversion—scanning and digitizing—of the PUD's facility maps. "Our paper maps weren't that good to begin with—they were sort of crude, almost schematic," says Oberlander. Instead, IDS opted for a complete field inventory using GPS to obtain facility locations with sub-meter accuracy.

This strategy took advantage of the PUD's facility data base, which had been carefully maintained on an IBM AS/400 for more than 10 years. "Often, the AS/400 data base was more accurate than the paper maps,"



Updated facility data and GPS locations were fed into the GIS and automatically populated the map with symbols for poles and other facilities (above and right)

says James Newton, IDS operations manager. Data from the AS/400 were loaded into a Microsoft Access data base, which then could be carried into the field on a ruggedized laptop and updated.

The inventory of 15,000 poles, pad mounts, and vaults throughout the 450-mi^2 service territory began in August 1996, and was completed in 13 months by one man, David Sakrisson of Power System Engineers, Tigard, Ore, an IDS subcontractor. Sakrisson, known to project members—and soon to the county police—as "Digital Dave," attracted considerable attention from local residents as he trekked alone throughout the mostly rural high desert of Franklin County. Wearing chaps and equipped with mace, a snakebite kit, a rugged computer, and a backpack GPS unit from Trimble Navigation, Sunnyvale, Calif, Sakrisson walked from facility to facility in urban areas; in rural areas he rode a motorcross bike between poles.

At each pole or pad mount, Sakrisson verified and appended information on approximately 20 attributes in the Access data base, then switched to Trimble's Aspen software and collected a GPS position. "He added a lot of data," says Oberlander. For poles, Sakrisson verified and appended information on crossarm assemblies, transformers, regulators, and other attributes. For vaults, he noted whether there were steel or concrete covers.

At the end of each week, Sakrisson sent IDS his data and the paper maps used to guide him from pole to pole. IDS post-processed Sakrisson's GPS data against area base station observations to improve the accuracy to 5 ft or better, then fed the data into an Oracle Corp (Redwood Shores, Calif) data base, which will ultimately replace the PUD's AS/400.

Up and running

The Oracle data base interfaces with geoFMS, a facilities management system software package from IDS that runs inside Microstation, to automatically populate the maps with the appropriate symbols in the correct locations. In most cases, says Oberlander, the pole symbols pop up exactly at the base of the pole shadows visible in the aerial photos. Once the poles are in place, IDS uses a digitizer to draw conductors between the poles, using existing paper maps to determine conductor routes and sizes.

That work, along with entering a backlog of service orders, is scheduled to be completed by August, although Oberlander thinks it will be finished earlier—probably by April. Several pilot areas are available already, and the high accuracy of the system is paying off, he says. "We can design on this system. We can measure distances and quantities on the maps, and derive accurate estimates."

He also notes that the tight control allows FRIS to economically update the base map. "The neat thing about tying the maps to GPS [coordinates] is that we can call an aerial photography company just to fly [and photograph] areas of the county that get developed." The updates will be shared—and paid for—by all FRIS members, he says.

Onto the Web

Indeed, although each FRIS participant received copies of the photogrammetric base map (on 103 CD-ROM disks), the consortium continues to share information. Currently, a T1 wide-area network (WAN) connects the participants to a central server at the county courthouse. "When we build a new [power] line to a property," says Oberlander, "we will have a direct connection to the courthouse to pull up property owner information." Within a year, he says, such data will be served up on a Web site using Intergraph's GeoMedia WebMap. "I'm working on setting that up right now," he adds. The PUD currently is in the process of linking the customer information system to the AM/FM/GIS. Soon, however, customer service representatives will also be able to access GIS data using standard Web browsers.

"Instead of going through Microstation and MGE—which are for high-end GIS maintenance," he says, "dispatchers and management will have access to a more user-friendly system [on the Internet]." In fact, he notes, GIS has grown more user-friendly just since 1996, when he attended the *AM/FM International Conference XIX* in Seattle, Wash, to learn more about the technology. "As long as there's a data base out there, and I have access to it, I can query it and use the data in my system." Oberlander also says he has manipulated GIS data in Access and Excel, both standard Microsoft Office applications. "Data today seem so open, and can be moved so easily from one platform to another—I never thought that would be the case when I went to the conference in Seattle." **it**

—Tim Reason

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